

REMARKS

Claims 30-44 are all the claims pending in the application, and stand rejected on prior art grounds. Claims 33, 34, 43, and 44 stand rejected on informalities. Applicants respectfully traverse these rejections based on the following discussion.

I. The Prior Art Rejections

Claims 30-44 stand rejected under 35 U.S.C. §102(e) as being anticipated by Mandelman et al., hereinafter “Mandelman” (US Patent No. 6,762,447). Applicants respectfully traverse this rejection because the opening 12 within Mandelman is only a rectangular opening, where the sidewalls of the opening 12 are straight from the bottom of the opening to the upper surface of the substrate. The structure disclosed in Mandelman includes additional materials (e.g., oxide collar 15) formed on the sidewalls of the opening 12; however, these materials do not change the shape of the straight sidewalls of the opening 12. To the contrary, with the claimed structure, the multiple rectangular shapes are formed by the different horizontal widths of the borders of the substrate material itself. In other words, with the claimed structure, the actual opening within the substrate contains multiple rectangular regions of different horizontal widths, while the Mandelman reference includes a rectangular opening that has materials formed on the straight opening sidewalls. Therefore, as explained in greater detail below, it is Applicants' position that the claimed structure is not anticipated by the Mandelman reference.

For example, the Office Action states that Mandelman discloses an IC structure comprising a substrate 10 (fig. 5); a bottle-shaped opening 12 (fig. 5) in the substrate 10 (fig.5), the bottle-shaped opening comprising/consisting a first rectangular portion (bottom portion of layer 14) and a second rectangular portion (middle portion of layer 14) and a third rectangular portion (top portion of layer 14), wherein the second rectangular portion has a larger dimension than the first and third rectangular portion.

However, Applicants submit that the opening 12 does not have a bottle shape for at least two reasons. First, there is no bottle shaped opening in the substrate 10, but instead there is only a rectangular opening 12. The opening 12 (i.e. what is removed from 10) is very simple and only includes vertical walls, a flat bottom, and does not include a re-entrant profile or a bottle neck. Secondly, the opening 12 is referred to by Mandelman and al. as “storage trench” or “deep storage trench”. A storage trench is much more than an opening. It includes a capacitor, a collar 15, and in this case a top portion above the collar. The capacitor has two plates (conductors or semiconductors) separated by a dielectric. Item 13 is the dielectric in this case. The bottom portion of above mentioned opening 12 in the substrate 10 provides the shape of one of the two plates. Thus, Mandelman only discloses a conventional vertical wall, flat bottom trench shape and not a bottle-shaped opening.

In fact, there is no lateral patterning of substrate 10 in the Mandelman structure. Therefore, Mandelman does not produce a dumbbell shaped capacitor. Only the polysilicon fill 14 of the deep storage trench 12 has the final shape of a dumbbell, and that is because dielectric 13 and collar 15 have different thicknesses, not because the opening is bottle-shaped. The capacitor is formed by the bottom end of the dumbbell only, excluding the middle and the top

To the contrary, in each of independent claims 30, 35, and 40 the structure is defined as including an opening whereby the borders of the substrate material form different width rectangles. For example, the claims recite that the "borders of said substrate material form a first rectangular portion and a second rectangular portion, wherein said second rectangular portion has larger dimensions in a horizontal direction than said first rectangular portion." As shown above, the opening 12 within the Mandelman structure is a rectangular opening with straight sidewalls running from the bottom of the opening to the upper surface of the substrate. Therefore, it is Applicants' position that Mandelman does not anticipate the structure defined by independent claims 30, 35, and 40. Further, dependent claims 31-34, 36-39, and 41-44 are similarly not anticipated by Mandelman not only because they depend from a non-anticipated independent claim, but also because of the additional features of the invention they define. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw this rejection.

III. Formal Matters and Conclusion

With respect to the objections of claims 33-34, and 43-44, the claims have been corrected, above, to remove the terms "said lateral openings" and "said trench." In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw this objection.

In view of the foregoing, Applicants submit that claims 30-44, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at

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the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary.

Please charge any deficiencies and credit any overpayments to Attorney's Deposit
Account Number 50-0510.

Respectfully submitted,

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